LSN (Life Safety Network) Inverter Suggested Specifications

1. General

1.1 Scope

Furnish and install a Dual-Lite LSN (Life Safety Network) Series Inverter System to provide a reliable source of emergency power, designed to operate during periods of utility line deficiencies without any interruption in power supplied to the connected load. The transfer from utility power to battery power shall utilize a true no break system to prevent sensitive loads from “winking out”. The system shall provide a pulse width modulated sine wave output to the connected load, and be capable of powering any combination of electronic, power factor corrected, fluorescent, incandescent or HID lighting. Other connected loads shall include but not be limited to: building management systems, motors, security systems and other critical voltage or frequency-sensitive electronic loads. The system shall operate from 0-100% loading, and be rated to deliver full KVA rated output at unity power factor for a minimum of 90 minutes. A boost-tap transformer shall provide regulated output during brownouts within -10% of incoming line voltage without transferring to battery. Upon return to normal AC utility line power, the system shall recharge the batteries without any interruption of power supplied to the load.

1.2 Codes & Standards

The Dual-Lite LSN Series Inverter System shall be listed to or comply with these standards:

- UL 924 Standard for Emergency Lighting and Power Equipment, when equipped with Type S batteries and a 90-minute run time.
- UL 1778 Standard for Uninterruptible Power Supply Equipment, when equipped with Type G or Type N batteries, or run times other than 90-minutes.
- ANSI C62.41: ANSI C62.45 (Cat. A & B)
- FCC class A
- National Electrical Code (NFPA 70)
- The Life Safety Code (NFPA 101)
- OSHA

2. Product

2.1 Manufacturer

The Central Inverter System specified herein shall be the LSN Series Inverter System manufactured by Dual-Lite, a Hubbell Lighting, Inc. Life Safety Products Brand.

2.2 Category and Type

Furnish and install a Dual-Lite LSN Inverter System that shall supply a minimum of _____KVA and ____KW @ unity power factor, for a period of ____ hours upon interruption, brownout, or failure of the monitored AC utility line.

2.3 Operation

System operation shall be fully automatic and include a linear transformer with boost tap and surge protection. In emergency mode, true “no break” Pulse Width Modulated (PWM) power shall be supplied to the load at all times.
The charging system will maintain the batteries at full capacity at all times.

Three on-board microprocessors will continuously monitor charger settings and the system’s overall readiness. Diagnostic circuitry shall include a multi-rate, software controlled charger, continuous monitoring of 265 operating parameters, and programmable system testing capabilities.

Thirty individual alarms and nine system logs shall be provided. All alarms and logs shall be automatically recorded and readily displayed via the User Interface Display (UID). The system shall also include one RS232 serial port for remote two-way communications

Automatic overload and short circuit protection in normal and emergency mode shall consist of 150% momentary surge capability, 120% overload for 5 minutes, and 110% overload for 10 minutes. Protection shall also include a low battery voltage disconnect, AC input circuit breaker, a DC input breaker, and an AC output fuse. A digitally generated sinusoidal output waveform (PWM) with less than 5% total harmonic distortion at rated linear load shall be provided to the connected load. A boost tap transfer protection circuit shall maintain the desired output voltage during low voltage "brownout" conditions without continuously switching to batteries, thereby preserving battery capacity.

2.4 Input Voltage

Available input voltage selection shall include 120, 208, 240, 277, and 347 volts, +10% to -15%, single phase, with a frequency of 60Hz. The AIC rating shall be 42,000 RMS symmetrical amperes.

2.5 Output Voltage

Available output voltage shall include 120, 208, 277, 120/240, 120/277, 120/208, 347, 120/347 volts, +/- 5%, single phase sine wave, with a frequency of 60Hz + 0.05Hz.
The output frequency, when on utility power, shall be as supplied by the utility.

2.6 System Diagnostics

The user interface display (UID) shall include an array of 5 LED's, a 2-line, 40-character LCD display, and a keypad for system input. The UID shall be menu-driven and display individual system parameters using a numbered code (Hot Key). The LED array shall indicate, by color code, the following status modes: AC output presence (green), system ready (green), battery charging (red), inverter "ON" (amber), and alarm functions (red).

To ensure only authorized personnel have system access, a multi-level password shall be required to change all functions and operating parameters.

A continuous scrolling display of the following metered functions shall be provided:

AC input voltage	AC output voltage	AC output amps	Battery voltage
Battery charging amps	Battery discharge amps	Output volt-amps (VA)	Output power (watts)
Power factor	Percent loading	Input frequency	Output frequency
Ambient temperature	Battery temperature	Last inverter run time	Total inverter run time
System run time	Date	Time	

2.7 Alarms

Thirty audible and visual alarms shall be provided, with automatic logging of the twenty-five most recent events. An alarm acknowledgement feature shall be provided, which will allow the user to silence only the current audible alarm without silencing other alarms or clearing the alarm condition until the fault has been addressed.

An alarm shall be sounded if any of the following operating conditions occur:

Low battery voltage	Near low battery voltage	High battery voltage	High AC input voltage
High AC output voltage	Low AC output voltage	Output overload (VA)	Low remaining run time
High ambient temperature	High heat sink temperature	System test failure	High battery temperature
Temperature probe failure	High transformer temperature	Tripped circuit breaker	

2.8 Manual and Automatic Testing

Manual and automatic test modes shall be provided.

- Manual user-initiated system test at any time
- Automatic weekly, monthly and annual self-diagnostic tests
- Automatic recording of the last twenty events in a Test Results log

2.9 Battery Charger

A three-step float charger shall be software controlled and temperatures compensated, and charge the batteries continuously while in normal “standby” condition (non emergency mode).

Following a power failure, the constant current charger mode shall be initiated until battery voltage reaches the equalize stage. Equalize stage shall be maintained until the charging current drops to .5 amps, or 0.3% of the battery amp/hour rating. Battery voltage shall then enter the float stage.

2.10 Batteries

To comply with UL Listing to Standard 924 (Emergency Lighting), Type S batteries shall be designed to provide a minimum 1.5 hours rated output voltage to the connected load in emergency mode without dropping below 87.5% of nominal battery voltage.

The batteries shall be enclosed in an enclosure that permits easy maintenance without requiring removal.

The following battery types shall be available:

____**Sealed Lead Calcium, VRLA, (Type S):** Maintenance Free Construction
Standard battery supplied, unless otherwise specified. Requires no addition of water over its useful life. The case and cover shall be constructed of polypropylene, contain a UL recognized low-pressure safety release vent, and be non-gassing in normal use. Life expectancy is 10-yeasr at 77°F (25°C) ambient temperature.

____**Sealed Lead Calcium VRLA (Type G):** Maintenance Free Construction
An optional long-life battery. Requires no addition of water over its useful. Life expectancy is 20-years at 77°F (25°C) ambient temperature.

____**Wet Cell Nickel Cadmium (Type N):** Wet cell construction
An optional long-life battery. Requires maintenance inspection and the addition of water to the cells when required. Pocket plate construction with a translucent case. Life expectancy is 25-years at 77°F (25°C) ambient temperature.

2.11 System Options

The following optional factory-installed equipment shall be available (see catalog for additional details).

___ **Normally-On Output Circuit Breaker Options:**

___ Monitored (recommended) _____Voltage ____ Amp Rating (20 amp is standard)

___ Unmonitored _____Voltage ____ Amp Rating (20 amp is standard)

A maximum of fourteen monitored positions (twenty positions without alarms - unmonitored) are available for all models. Single pole 120V and 277V breakers occupy one position each, while double pole 240V breakers occupy two positions (7 monitored, 10 unmonitored) each. When

specifying circuit breaker options, decrease the available number of output breakers by the proper number of positions chosen.

___ **Normally-Off Output Breaker Options:**

___ Monitored (recommended) _____Voltage ____ Amp Rating (20 amp maximum)

___ Unmonitored _____Voltage ____ Amp Rating (20 amp maximum)

Used when the lighting fixtures are to be energized only during a power outage. The normally-off circuit breakers are user programmable for a delay of up to 999 seconds. A maximum of eight positions are available for all models. Single pole 120V and 277V breakers occupy one position each, while double pole 208V or 240V breakers occupy two positions each. When specifying circuit breakers, decrease the available number of output breakers by the proper number of positions chosen.

___ **Alternate Run Time (AR):**

UL Listed to Standard 1778 (Uninterruptible Power Supply Equipment)
Up to four-hour run time is available. Example: AR240.

[Note: The National Electrical Code (NEC) requires a minimum of 90-minute run times for emergency lighting installation requirements].

___**Short Battery Cabinet (SBC):**

For applications where headroom is limited, the Short Battery Cabinet (SBC) can be used to reduce the overall installation by 15 inches. Available with 1.0, 2.0, 2.7, 3.7, 5.5 and 6.6 KVA systems with Type S batteries only. Consult factory for additional details

___ **Cat 60 Cabinet Locks (CL60):**

Universal cabinet locks for all electronic and battery cabinets

___ **Email Device (EML):**

A device that automatically notifies the user of system test results and alarm conditions. The email device sends detailed notifications to up to six pre-programmed email addresses. Requires customer supplied CAT5 cable connected to user network. Each designated email address automatically receives a unit status report following all weekly, monthly and annual tests or when an alarm condition is detected. Status reports include readings on key operating parameters, as well as complete alarm and inverter log printouts in uncoded user-friendly descriptions.

___ **Remote Status Panel (RSP):**

Provides remote system annunciation of inverter and alarm status. Operates up to 1,000 feet away.
The following color-coded indicators are provided:
Alarm LED (Red)
Audible Alarm
Charging LED (Red)
Emergency Power LED (Yellow)
Ready LED (Green)
A/C On LED (Green)

___ **System Monitoring Terminals (SMT):**

Provides two PC-board mounted terminal blocks to allow customer access to RSP (Remote Status Panel) outputs, Inverter and Alarm active relays. These low power contacts (commonly referred to as “dry contacts”) can be set for a time delay of up to 999 seconds. They incorporate normally-open and normally-closed contacts.
Access to +12 Volts DC, DC ground and two normally-off relay driver signals are also provided.

___ **Charger Upgrades (C10 or C20):**

For enhanced battery recharge time:

- C10 – 10 Amp charger upgrade. Available on 1.0kVA – 4.8kVA Series
- C20 – 20 Amp charger upgrade. Available on 5.5kVA – 17.5kVA Series
  - Not available with 120V input on 6.6kVA and above.
  - Not available with 208V input on 12.5kVA and above.
  - Not available with 204V input on 15kVA and above.

___ **Internal Maintenance Bypass Switch (IBS):**

A factory-installed, internally-mounted three-position “make before break” switch. Compatible with all input/output combinations and any combination or quantity of output circuit breakers. Allows connecting the utility power supply to the load without placing the inverter in emergency mode.

___ **Extended Training (ATV):**

If user personnel are not available for training during the factory start-up procedure, a Dual-Lite technician shall be scheduled for a later visit at additional cost.

2.12 System Accessories

The following accessories shall be available with the system:

___ **External Maintenance Bypass Switch (MBB or BBM):**

The external maintenance bypass switch allows power to be removed from the inverter system and remain connected to the load. This allows the inverter system to be completely removed, replaced or repaired without interruption to the load. The switch is supplied in a wall mounted, NEMA 1 enclosure. Available in Make-Before-Break (MBB) or Break-Before-Make (BBM) configurations. Not for use with systems having more than one single-pole output circuit breaker, or systems with different input and output voltages.

2.13 Maintenance, Service and Enhanced Warranty Plans

The following shall be offered to assure initial and long term viability of the system through additional maintenance and service plans and/or through enhancements to the standard two-year electronics limited warranty.

_FS_ Factory Start-Up (FS):

Factory Start-Up shall be supplied as an inverter system standard at no additional cost. The Factory Start-Up process shall verify correct installation and operation of the inverter system. Trained, factory-authorized technicians shall administer an on-site, point-by-point check of the system to include:

- ●Internal electrical connections
- ●System operating voltages
- ●Initial system "power-up
- ●Correction of existing deficiencies
- ●Training of available operating personnel
- ●AC input and Battery connections
- ●System operating parameters
- ●Battery discharge test
- ●Final testing, calibration and recording

_____ Monitoring Program (MP):

The unique, optional Monitoring Program shall provide for the continuous monitoring of the inverter system by the Factory Technical Support Group. All weekly, monthly and annual system tests shall be reviewed and analyzed for early warning signs of system malfunction. Any failures shall be automatically relayed to the service department where corrective action can be recommended to the owner/operator. For activation, a user supplied dedicated analog phone line must be available.

____ Preventive Maintenance Plan (PMP-____):

The Preventive Maintenance Plan shall provide optional warranty system coverage beyond the standard two-year factory warranty. PMP warranty service excludes the batteries, which are covered under a separate warranty plan. The purchase of a Fax Modem option shall be required when a Preventive Maintenance Plan is selected.

Available Preventive Maintenance Plans (Fax Modem Option Required)

PMP-A1: Additional 1-year warranty and 1-year service coverage, weekdays, Monday-Friday, 8AM to 5PM EST.	**PMP-A2:** Additional 2-year warranty and 2-year service coverage, weekdays, Monday-Friday, 8AM to 5PM EST.	**PMP-A3:** Additional 3-year warranty and 3-year service coverage, weekdays, Monday-Friday, 8AM to 5PM EST.
PMP-B1: Additional 1-year warranty and 1-year service coverage, 24 hours/day, 7 days/week, no holidays.	**PMP-B2:** Additional 2-year warranty and 2-year service coverage, 24 hours/day, 7 days/week, no holidays.	**PMP-B3:** Additional 3-year warranty and 3-year service coverage, 24 hours/day, 7 days/week, no holidays.
PMP-C1: Additional 1-year warranty and 1-year service coverage, 24 hours/day, 7 days/week, including holidays.	**PMP-C2:** Additional 2-year warranty and 2-year service coverage, 24 hours/day, 7 days/week, including holidays.	**PMP-C3:** Additional 3-year warranty and 3-year service coverage, 24 hours/day, 7 days/week, including holidays.

If the standard factory warranty has expired before selection and purchase of a PMP plan, an on-site evaluation shall be scheduled to determine if the system requires parts and/or labor to return to factory specifications. Parts and labor required shall be charged at additional costs.

2.14 Mechanical

The system shall be contained in a code gauge, steel NEMA 1 enclosure, finished in a scratch resistant, powder coat finish, with a key lock, conduit knockouts at the top and sides, and front opening doors with air filters. Enclosures shall be designed to allow stacking to minimize the overall system's footprint. The system shall include a plenum to expel heated air from inside the unit. All components shall be front accessible and incorporate a modular design and a quick disconnect means to facilitate servicing.

3. Execution

3.1 Wiring

Input and output conductors shall be enclosed in separate conduits.
All load side wiring shall be sized as required for voltage drop conditions to assure proper operation of connected loads.

3.2 System Operation

The system shall allow connection of both "normally on" and "normally off" (optional) loads. Connected loads shall receive utility power during normal operation, and 'no break" system inverter power during utility interruptions.

3.3 Connected Loads

In emergency mode, the inverter system shall supply true digitally-generated AC sinusoidal output. Refer to plans for type and location of loads served by the system.

3.4 Factory Start-up

A factory trained service representative shall be dispatched to perform the initial system start-up. Refer to Section 2.13 for additional information.

3.5 Drawings and Manuals

___Installation/Users manual(s) for locating, mounting, interconnecting, and wiring the system with operating and preventive maintenance procedures. (Can be located on www.dual-lite.com)

3.6 Installation

The system shall be installed in accordance with all appropriate manufacturers' instructions and in compliance with all appropriate codes.

3.7 Warranty

The system shall be guaranteed, under normal and proper use, against defects in workmanship and materials for a period of two years from the date of shipment. Batteries supplied as part of the systems shall be covered under a separate pro-rata warranty as described below.

- **Sealed Lead Calcium VRLA, 10-year life expectancy (Type S) –** one-year full replacement warranty plus an additional nine years pro-rata.
- **Sealed Lead Calcium, 20-year life expectancy (Type G)** – One year full replacement warranty plus an additional fourteen years pro-rata.
- **Wet Cell Nickel Cadmium, 25-year life expectancy (Type N)** – One year full replacement warranty plus an additional fourteen years pro-rata.

Note: Within 90days from date of shipment, batteries shall be connected to an energized charging system to maintain the Warranty. Battery life and capacity is rated at an optimum operating temperature range of 68°F to 85°F. Operating temperatures outside this range will affect battery life and capacity. Batteries are rated at 100% capacity at 77°F.

3.8 Maintenance and Service

Maintenance and service programs shall be made available by the supplier to assure long-term reliability of the system. Refer to Section 2.13 for additional information.

Specifications subject to change without notice.